

# WORK MEASUREMENT AND PRODUCTIVITY IMPROVEMENT<sup>1</sup>

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**Abstract.** In the past, equitable evaluation of the work performed by contract or company overhead line clearance crews was not easily accomplished. In 1972, Ohio Edison Company developed and implemented a Work Measurement System as a solution to this problem. Over the years, the System has been automated, enhanced, expanded, and refined. Most importantly, it has been used effectively to improve the efficiency of the overall operation and, thereby, significantly reduce costs.

**Résumé.** Par le passé, une évaluation équitable du travail exécuté par les équipes de dégagement de réseaux aériens contractuelles ou de compagnies n'était pas accompli aisément. En 1972, la Compagnie Ohio Edison développait et mettait en oeuvre un système de mesure de travail comme solution à ce problème. Avec les années, le système a été automatisé, amélioré, élargi et raffiné. Plus important encore, il a été effectivement employé pour améliorer l'efficacité de l'opération d'ensemble et, de ce fait, réduire significativement les coûts.

Ohio Edison Company (OE) is an investor-owned electric utility located in the northeast and central portions of Ohio. A wholly-owned subsidiary, Penn Power is located in northwestern Pennsylvania. System wide, over one million customers are served in the 9,000 square mile service territory. The Ohio portion of the Company covers 7,505 square miles, and serves approximately 885,000 customers. It is to that portion of the System that I will confine my remarks. The scope of this discussion will be further limited to work measurement as a part of the Distribution Overhead Line Clearing Program, although there are similar systems in place for the transmission program.

Most recent estimates show that there are approximately 991,000 trees which are affecting the 19,000 miles of distribution lines. Our goal is to maintain these trees on a four-year cycle, which requires trimming 225 to 250 thousand trees per year, in addition to removing 60 to 80 thousand trees and spending 80 thousand man-hours on preventive maintenance (brushing and spraying) per year. To accomplish this work, a combined work force of 145 contractor and Ohio Edison

crews is required.

In the past, Ohio Edison, as did most other utilities, used only the man-hours per tree trimmed and man-hours per tree removed statistics to evaluate the effectiveness of both our own and contracted line clearance crews. Fair analysis (evaluations) with these limited data was not possible. There was no way to determine if the crew was really effective or assess if the task was simple or difficult. There was no way to confirm or refute the "Pat" answers that would be given when questions were asked about the resulting statistics. There was no way to determine what part of the work performance was contributed by supervision or management of either the contractor or OE. What was needed was the ability to hold the work group (crew, supervisor, contractors, etc.) accountable only for those things within their control.

In 1972, Ohio Edison management provided the opportunity to develop a Work Measurement System to better evaluate the effectiveness of the line clearance work force in one division. The result of that development was a prototype hand-operated system that used standard work measurement techniques. The major types of work were defined by uniform work units referred to as work packages. By analysis of time/motion studies and historical data, values (standard times) were assigned to each work package. This permitted the calculation of the typical work measurements of Performance, Utilization, and Efficiency. The use of the hand-operated system evolved slowly over the next seven years, and by 1979 was in use at all but one of the nine OE operating Divisions. In 1979 the system was further refined and automated on a mini-computer somewhat similar to today's personal computers.

Automation removed much of the tedious hand labor and facilitated addition of several summary levels. With automation the system was implemented in the ninth Division. In 1984 the Work

1. Presented at the annual conference of the International Society of Arboriculture in Toronto in August 1990.

Measurement System was put on the mainframe computer and since then, has been expanded into a full-blown work management system.

The Ohio Edison Forestry Work Measurement System measures both the quantity and quality of work produced. It is important to measure both since they are interdependent—that is, they must both be measured in order to get the total picture. For example: which crew is most effective, the one that trims a large number of trees but only obtains one foot of clearance on each tree, or the crew that trims a lesser number of trees but obtains enough clearance to last for at least four years?

Of the established quantity measures, Performance measures the work performed against the standards for that work, and is represented by the formula. **Performance = Standard Time for Work Units ÷ Actual Time for Work Units.** Utilization is the ratio of the time spent on productive work to the time available for producing, which is represented by the formula. **Utilization = Time spent producing ÷ Time available for production.** The last quantity measure, Efficiency, is the measure of work produced related to the time available for working, and is calculated by the formula. **Efficiency = Performance x Productivity.** Of the three quantity measures, Efficiency is considered to be the "Bottom Line."

Quality is measured by a field audit of 5% to 10% of the work completed by each crew. This audit assesses both the quality of the work and the quality of the program. The parameters used to assess the quality of the work center around validating the accuracy of work and reporting, and checking for compliance with the contract guidelines and specifications. To evaluate the program quality, several factors are reviewed to determine if the work group is striving to meet the Ohio Edison line clearing objectives.

Both Quantity and Quality measures are available at various levels of detail and reporting. The most detailed level is crew with roll-up repor-

ting to the District/Bid Area, Contractor, Division, and Company levels. Reporting at these various levels facilitates the evaluation and sharing of data at the level of detail appropriate to the work group receiving it.

The key to the value of any work measurement system is not what or how much data you collect, but the utilization of that data. At Ohio Edison the information gathered through the Work Measurement System is utilized in many ways. It is used to identify areas for improvement as well as areas of excellence, keep contractors and employees informed, set goals, monitor performance against goals, evaluate and award bids, and prepare and implement incentive contracts.

In the past eight years, 1981-1989, the use of the Work Measurement System to evaluate, develop, and improve the work efforts of the overhead line clearance work force has resulted in a 34.4% improvement in Performance, 7.3% improvement in Utilization, and a "Bottom Line" 46.2% increase in Efficiency. This translates into significant dollar savings. It has allowed Ohio Edison to maintain a constant budget for the past five years (1985-1989), which when converted to constant year dollars, to account for inflation, reveals an actual budget decrease of 1.3 million dollars. At the same time, the trimming cycle has been maintained at four years or better and the goals for preventive maintenance and tree removal have been met.

Evaluation through work measurement has been an important tool for the management of the overhead line clearing work force at Ohio Edison, and promises to provide continued benefits in the future.

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